

## **Claims**

1. A process for preparing a polyacrylate having an at least bimodal molecular weight distribution, characterized in that a monomer mixture which comprises
- 5 a1) acrylic acid and/or acrylic esters of the formula  $\text{CH}_2=\text{C}(\text{R}')(\text{COOR}^2)$ , where  $\text{R}' = \text{H}$  or  $\text{CH}_3$  and  $\text{R}^2$  is an alkyl chain having 1 to 20 carbon atoms, at 70%-100% by weight, based on the polymer,
- 10 a2) olefinically unsaturated monomers containing functional groups, at 0-30% by weight, based on the polymer, is polymerized in an at least two-phase free-radical polymerization to give a polyacrylate having a broad, at least bimodal molecular weight distribution,
- 15 polymerization taking place in a first phase of the at least two-phase polymerization, by means of a low initiator concentration relative to the monomer, to give a first polymer having a molecular weight which is high on average, and, before the monomer mixture has been completely consumed by reaction, a next phase of polymerization is started, by the addition at least once of a regulator, and in this further phase or further phases a further polymer is synthesized having a molecular weight which is relatively low on average.
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- 25 2. The process of claim 1, characterized in that the at least two-phase free-radical polymerization is taken to a total conversion of all phases of greater than 97%.
- 30 3. The process of claim 1 or 2, characterized in that the polymerization is carried out in two phases and a bimodal molecular weight distribution is built up, the molecular weight maxima in the molecular weight distributions of the two polymers being preferably at least 50 000 g/mol apart.
- 35 4. The process of any one of claims 1 to 3, characterized in that the polydispersity of the polymers is greater than 6.
5. The process of any one of claims 1 to 4, characterized in that the

molar ratio of monomer mixture to initiator is less than 0.005, preferably less than 0.003.

- 5 6. The process of any one of claims 1 to 5, characterized in that the addition of initiator takes place in two or more steps.
7. The process of any one of claims 1 to 6, characterized in that alcohols, ethers, dithioethers, dithiocarbonates, trithiocarbonates, nitroxides, alkyl bromides, thiols, TEMPO or TEMPO derivatives are  
10 used as regulators.
8. The process of any one of claims 1 to 7, characterized in that the regulator is added no earlier than after one hour's polymerization time but no later than two hours before the end of polymerization.  
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9. A polyacrylate as obtainable according to any one of claims 1 to 8, characterized in that it comprises the following monomer units:  
a1) acrylic acid and/or acrylic esters of the formula  $\text{CH}_2=\text{C}(\text{R}')(\text{COOR}^2)$ , where  $\text{R}' = \text{H}$  or  $\text{CH}_3$  and  $\text{R}^2$  is a linear,  
20 branched or cyclic alkyl chain having 1 to 20 carbon atoms, at 70%-100% by weight, based on the polymer,  
a2) olefinically unsaturated monomers containing functional groups, at 0-30% by weight, based on the polymer,  
25 and in that it has a broad, at least bimodal molecular weight distribution, the molecular weight maxima in the molecular weight distributions of at least two polymers being preferably at least 50 000 g/mol apart.
- 30 10. The polyacrylate of claim 9, characterized in that the olefinically unsaturated monomers containing functional groups are selected from the following vinyl compounds containing functional groups: maleic anhydride, vinyl acetate, acrylamides, and double-bond-functionalized photoinitiators.
- 35 11. The polyacrylate of claim 9 or 10, characterized in that it further comprises crosslinkers, photoinitiators, resins customary for polyacrylates, plasticizers, fillers, expandants, compounding agents and/or aging inhibitors.

12. The use of the polyacrylate of any one of the preceding claims as a pressure-sensitive adhesive.
- 5 13. The use of claim 12 for an adhesive tape, the acrylate pressure-sensitive adhesive being present as a single-sided or double-sided film on a carrier film.